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production in the parent. Two hypotheses are offered to account for the appearance of these two types among the seedlings: (1) that they are mutations produced as a result of traumatism in accordance with the views of BLARINGHEM; and (2) that the ordinary horseradish is not a natural species as generally believed by taxonomists, but a hybrid, and that the two types of offspring produced from the seeds are partial or complete returns to its parent types. The author inclines to the latter view, and would interpret the sterility of the horseradish as due, not to the accentuated development of fleshy roots, but to a weakening of the sexual development, not infrequently found in hybrids. The reviewer is inclined also to the latter interpretation, and would point out the important bearing the author's method of securing seeds of the horseradish may have in its application to other sterile hybrids. Many experiments have been terminated by the failure of hybrids to produce seeds. It may be that some of these cases will yield to methods of treatment similar to that employed by BRZEZIŃSKI in securing seeds of horseradish.—GEO. H. SHULL.

The ecology of conifers.—STOPES and MOSS have discussed the xerophytism of conifers, and now GROOM⁸ considers a number of their ecological features. In the introductory statement three problems are outlined: the cause of their xerophytic foliage and tracheidal wood, the cause of their survival in competition with dicotylous trees, and the cause of the suppression of many forms in past ages. GROOM correctly concludes that not all conifers are xerophytic, in spite of their xerophytic leaf structure, calling attention to VON HÖHNEL's demonstration of high transpiration in the larch, and to his own experiments which show that coniferous wood, in spite of its tracheidal structure, may conduct water with a rapidity equal to that of a rapidly transpiring dicotylous tree. Attention is called to the fact that the aggregate leaf surface of a coniferous tree may exceed that of a dicotylous tree, because of the immense number of leaves. Indeed, GROOM regards the xerophytic structure of the leaf as a necessity in view of the great amount of exposed surface, and he applies the term "architectural xerophytism" to xerophytism that is dependent upon the organization of the plant rather than upon the direct influence of external factors upon the organs in question. In opposition to STOPES, GROOM regards the tracheidal nature of the wood as a feature of advantage rather than a feature necessitated by heredity, and notes that similar wood tends to occur in various evergreen dicotyls. The extinction of many conifers of past ages is attributed to their imperfect acclimatization, to the fact that they have a great number of insect and fungus enemies, and to their relatively slight power to react advantageously to new conditions. However, their architectural xerophytism makes it possible for them to thrive in nearly all situations, from those that are physically or physiologically dry

⁸ GROOM, PERCY, Remarks on the oecology of Coniferae. *Annals of Botany* 24: 241-269. 1910.

to those that are sufficiently humid to permit the development of luxuriant mesophytic forests. GROOM's paper is most suggestive, and adds considerably to our knowledge concerning the difficult problem of coniferous xerophytism.—HENRY C. COWLES.

Nutrition of the embryo in Labiatae.—BILLINGS⁹ has investigated the nutritive mechanism associated with the embryo sac of certain Labiatae, a subject that deserves more attention from morphologists. The ordinary sac which is oval or elliptical in longitudinal section, and which encroaches uniformly upon the surrounding tissues, has come to be regarded as the more or less fixed "type" of angiospermous sac. Among the Sympetalae especially, however, a much more complex nutritive mechanism has begun to be uncovered, including special digestive layers and special absorptive regions of the sac, the latter usually taking the expression of tubular haustorial extensions. BILLINGS investigated 15 species of Labiatae, representing 14 of the most representative genera. The results were uniform enough and differed enough from other sympetalous groups investigated to indicate that such structures may be of taxonomic and even of phylogenetic value. For example, the Scrophulariaceae previously described usually have a well developed digestive layer ("tapetum"), in addition to haustorial extensions of various kinds; but the Labiatae lack the special digestive layer. There are three features common to the species studied, and possibly to the whole family, to which the author calls attention: the micropylar haustorium (more or less extensively developed), the much-elongated suspensor, and the antipodal canal or process. *Salvia* is an exception to this statement, for it has a short suspensor and no micropylar haustorium; and the two species investigated "are unique in having two haustorial outgrowths, one coenocytic and one composed of ordinary endosperm tissue" (these haustoria are in addition to the well developed antipodal canal). The author thinks that such variations from the general conditions as are shown by *Salvia* "suggest a taxonomic rearrangement."—J. M. C.

Correlation in oats.—WALDRON¹⁰ has compared the height of culm, length of head, number of grains per head, and average weight of grains in a variety of oats growing at Dickinson, North Dakota. The examination of 1000 plants discovered decided negative correlations (-0.595 ± 0.013 , -0.511 ± 0.015 , and -0.404 ± 0.017) between the weight of grains and number of grains per head, weight of grains and length of head, and between weight of grains and length of culm. He reaches the conclusion that in selecting the heaviest grains in this variety, the breeder selects plants somewhat below the

⁹ BILLINGS, F. H., The nutrition of the embryo sac and embryo in certain Labiatae. Kansas Univ. Bull. 5:67-83. pls. 11-14. 1909.

¹⁰ WALDRON, L. R., A suggestion regarding heavy and light seed-grain. Amer. Nat. 44:48-56. 1910.